CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application. Where claims have been amended and/or canceled, such amendments and/or cancellations are done without prejudice and/or waiver and/or disclaimer, and the applicant reserves the right to claim this subject matter in a continuing application:

1. (Currently amended) A method for analyzing one-way delay in a packet switched network, comprising:

varying a Time To Live (TTL) value in a trace packet sent from a source and addressed to a destination endpoint to intentionally cause an intermediate node other than the destination endpoint in the packet switched network to send back to the source a packet expiration notice indicating expiration of the TTL value; and

receiving an intermediate node time value determined by the intermediate node in the packet expiration notice indicating when the intermediate node received the trace packet.

2. (Original) The method according to claim 1 including sending a source time value in the trace packet indicating when the trace packet was sent and receiving both the source time value and the intermediate node time value in the packet expiration notice.

3. (Previously Presented) The method according to claim 1 including:

setting a first TTL value in a first trace packet causing a first intermediate node to send back a first packet expiration notice with a first time value associated with a one-way packet delay to the first intermediate node; and

setting a second larger TTL value in a second trace packet causing a second intermediate node other than the destination endpoint to send back a second packet expiration notice with a second time value associated with a one-way packet delay to the second intermediate node.

4. (Previously Presented) The method according to claim 3 including setting incrementally increasing TTL values in additional trace packets until the destination endpoint

sends back a packet expiration notice with a time value associated with a one-way packet delay from the source endpoint to the destination endpoint.

5. (Previously Presented) The method according to claim 1 including:

using a Network Time Protocol (NTP) timestamp value for the intermediate node time value;

inserting the NTP timestamp value into an Internet Control Message Protocol (ICMP) message; and

using the ICMP message as the packet expiration notice.

6. (Previously Presented) The method according to claim 5 including using bits in an unused field of the ICMP message for containing the NTP timestamp value.

7. (Original) The method according to claim 1 including formatting the trace packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as corresponding RTP payload packets containing media content.

8. (Previously Presented) The method according to claim 7 including varying the TTL value and setting a marker bit in the trace packet causing the destination endpoint to send a corresponding Real Time Control Protocol (RTCP) report.

9. (Original) The method according to claim 8 including determining whether or not to transmit a media stream according to contents of the RTCP report.

10. (Currently amended) A network processing device, comprising:

a processor at a source endpoint sending a packet addressed to a destination endpoint that intentionally causes an intermediary node other than the destination endpoint to send back to the source endpoint a message containing an intermediate node timestamp value identifying when the packet reached the intermediate node.

11. (Previously Presented) The network processing device according to claim 10 wherein the processor is enabled to specify a Time To Live (TTL) value in the packet insufficient to reach the destination endpoint, and causing the intermediary node to send back the message when the TTL value is decremented to zero.

12. (Previously Presented) The network processing device according to claim 11 wherein the processor modifies the TTL values in multiple packets causing multiple different intermediate nodes in a network to send back messages each containing a respective intermediate node timestamp value when the TTL values in the packets are decremented to zero by that intermediate node.

13. (Original) The network processing device according to claim 10 wherein the processor discerns when the packet was sent and compares that time with the intermediate node timestamp value returned in the message to determine the one-way packet delay between the processor and the intermediate node.

14. (Original) The network processing device according to claim 10 wherein the processor formats the packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as associated RTP payload packets containing an actual media payload.

15. (Previously Presented) The network processing device according to claim 14 wherein the processor sets a Time To Live (TTL) value and a marker bit in the packet that causes the destination endpoint to send back a Real Time Control Protocol (RTCP) report.

16. (Original) A network processing device, comprising:

a processor configured to receive a trace packet containing an expiration value causing the processor to discard the trace packet and generate an expiration message that identifies a time value associated with when the trace packet was received by the processor.

17. (Original) The network processing device according to claim 16 wherein the network processing device is located at an intermediate location in a network between a source endpoint sending the trace packet and a destination endpoint for the trace packet.

18. (Original) The network processing device according to claim 17 wherein the processor is configured to decrement the expiration value and forward the trace packet toward the destination endpoint when the decremented expiration value is not zero, the processor further configured to discard the trace packet and send the expiration message back to the source endpoint when the expiration value is decremented to zero.

19. (Previously Presented) The network processing device according to claim 16 wherein the processor uses an Internet Control Message Protocol (ICMP) message as the expiration message and uses a Network Time Protocol (NTP) timestamp value as the time value.

20. (Original) The network processing device according to claim 16 wherein the trace packet is formatted as a media payload packet that uses a same media path as associated media packets containing a media payload.

21. (Currently amended) A system for analyzing one-way delay in a packet switched network, comprising:

means for varying a Time To Live (TTL) value in a trace packet from a source and addressed to a destination endpoint to intentionally cause an intermediate node other than the destination endpoint in the packet switched network to send back to the source a packet expiration notice indicating expiration of the TTL value; and

means for receiving an intermediate node time value determined by the intermediate node in the packet expiration notice indicating when the intermediate node received the trace packet.

22. (Original) A system according to claim 21 including means for sending a source time value in the trace packet indicating when the trace packet was sent and receiving both the source time value and the intermediate node time value in the packet expiration notice.

23. (Previously Presented) A system according to claim 21 including:

means for setting a first TTL value in a first trace packet causing a first intermediate node to send back a first packet expiration notice with a first time value associated with a one-way packet delay to the first intermediate node; and

means for setting a second larger TTL value in a second trace packet causing a second intermediate node other than the destination endpoint to send back a second packet expiration notice with a second time value associated with a one-way packet delay to the second intermediate node.

24. (Previously Presented) A system according to claim 23 including means for setting incrementally increasing TTL values in additional trace packets until the destination endpoint sends back a packet expiration notice with a time value associated with a one-way packet delay from the source endpoint to the destination endpoint.

25. (Previously Presented) A system according to claim 21 including:

means for using a Network Time Protocol (NTP) timestamp value for the intermediate node time value;

means for inserting the NTP timestamp value into an Internet Control Message Protocol (ICMP) message; and

means for using the ICMP message as the packet expiration notice.

26. (Previously Presented) A system according to claim 25 including means for using bits in an unused field of the ICMP message for containing the NTP timestamp value.

27. (Original) A system according to claim 21 including means for formatting the trace packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as corresponding RTP payload packets containing media content.

28. (Previously Presented) A system according to claim 27 including means for varying the TTL value and setting a marker bit in the trace packet causing the destination endpoint to send a corresponding Real Time Control Protocol (RTCP) report.

29. (Original) A system according to claim 28 including means for determining whether or not to transmit a media stream according to contents of the RTCP report.

30. (Currently amended) A computer readable medium for analyzing one-way delay in a packet switched network, comprising:

varying a Time To Live (TTL) value in a trace packet from a source and addressed to a destination endpoint to intentionally cause an intermediate node other than the destination endpoint in the packet switched network to send back to the source a packet expiration notice indicating expiration of the TTL value; and

receiving an intermediate node time value determined by the intermediate node in the packet expiration notice indicating when the intermediate node received the trace packet.

31. (Original) A computer readable medium according to claim 30 including sending a source time value in the trace packet indicating when the trace packet was sent and receiving both the source time value and the intermediate node time value in the packet expiration notice.

32. (Previously Presented) A computer readable medium according to claim 30 including:

setting a first TTL value in a first trace packet causing a first intermediate node to send back a first packet expiration notice with a first time value associated with a one-way packet delay to the first intermediate node; and

setting a second larger TTL value in a second trace packet causing a second intermediate node other than the destination endpoint to send back a second packet expiration notice with a second time value associated with a one-way packet delay to the second intermediate node.

33. (Previously Presented) A computer readable medium according to claim 32 including setting incrementally increasing TTL values in additional trace packets until the destination endpoint sends back a packet expiration notice with a time value associated with a one-way packet delay from the source endpoint to the destination endpoint.

34. (Previously Presented) A computer readable medium according to claim 30 including:

using a Network Time Protocol (NTP) timestamp value for the intermediate node time value;

inserting the NTP timestamp value into an Internet Control Message Protocol (ICMP) message; and

using the ICMP message as the packet expiration notice.

35. (Previously Presented) A computer readable medium according to claim 34 including using bits in an unused field of the ICMP message for containing the NTP timestamp value.

36. (Original) A computer readable medium according to claim 30 including formatting the trace packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as corresponding RTP payload packets containing media content.

37. (Previously Presented) A computer readable medium according to claim 36 including varying the TTL value and setting a marker bit in the trace packet causing the destination endpoint to send a corresponding Real Time Control Protocol (RTCP) report.

38. (Original) A computer readable medium according to claim 37 including determining whether or not to transmit a media stream according to contents of the RTCP report.

39. (Previously Presented) The method according to claim 7 wherein the trace packet is part of a same media stream as the RTP payload packets.

40. (Previously Presented) The network processing device according to claim 19 wherein the Network Time Protocol (NTP) timestamp value is placed in an unused field of the ICMP message.

41. (Previously Presented) The network processing device according to claim 20 wherein the trace packet is part of a same media stream as the media packets containing the media payload.

42. (Currently amended) A method for analyzing one-way delay in a packet switched network, comprising:

formatting a trace packet for transferring on a path that extends from an origination endpoint, through at least one intermediary node in the packet switched network, to a destination endpoint that is different than the intermediary node, said formatting including addressing the trace packet with a destination address that corresponds to the destination endpoint;

selecting a Time To Live (TTL) value for the trace packet, the selected TTL value to intentionally cause the intermediate node to send back to the origination endpoint a packet expiration notice; and

receiving the packet expiration notice; and

extracting an intermediate node time value from the packet expiration notice, the intermediate node time value ~~packet expiration notice~~ inserted by the intermediate node in the packet expiration notice and indicating when the intermediate node, not the destination node, received the trace packet.

43. (Previously Presented) The method of claim 42 wherein intermediate node time value is used, at least in part, to determine one-way packet delay from the source endpoint to the intermediate node.

44. (Currently Amended) The method of claim 43 wherein the packet expiration notice is an Internet Control Message Protocol (ICMP) message with a Network Time Protocol (NTP) timestamp inserted therein.

45. (Previously Presented) The method of claim 44 further comprising:

formatting the trace packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as corresponding RTP payload packets containing media content.

46. (Currently amended) ~~The~~ A method ~~of claim 45~~ for analyzing one-way delay in a packet switched network, comprising:

formatting a trace packet for transferring on a path that extends from an origination endpoint, through at least one intermediary node in the packet switched network, to a destination endpoint that is different than the intermediary node, said formatting including addressing the trace packet with a destination address that corresponds to the destination endpoint;

selecting a Time To Live (TTL) value for the trace packet, the selected TTL value to intentionally cause the intermediate node to send back a packet expiration notice; and

receiving the packet expiration notice;

extracting an intermediate node time value from the packet expiration notice, the packet expiration notice inserted by the intermediate node and indicating when the intermediate node, not the destination node, received the trace packet;

formatting the trace packet as a Real Time Protocol (RTP) payload packet that travels along a same media path as corresponding RTP payload packets containing media content;

wherein intermediate node time value is used, at least in part, to determine one-way packet delay from the source endpoint to the intermediate node;

wherein the packet expiration notice is a Internet Control Message Protocol (ICMP) message with a Network Time Protocol (NTP) timestamp inserted therein; and

wherein, at a time the trace packet is sent, the existence of the destination node on the path is known by the originating endpoint while the existence of the intermediary node on the path is not known, such that the originating node receives back a communication indicating the time that a previously unknown node received the trace packet.

47. (New) The method of claim 42 further comprising:

formatting the trace packet as a media trace packet that travels along a same media path as corresponding media payload packets containing media content.

48. (New) The method of claim 47 wherein the media trace packet is sent over the media path after the media path is reserved.

49. (New) The method of claim 47 wherein the media path is established with the destination endpoint.

50. (New) The method of claim 1, wherein, at a time the trace packet is sent, existence of the destination endpoint on a path for the trace packet is known by the source while existence of the intermediate node on the path is not known by the source, such that the source receives back a communication indicating a time that a previously unknown node received the trace packet.

51. (New) The method of claim 10, wherein, at a time the packet is sent, existence of the destination endpoint on a path for the trace packet is known by the source endpoint while existence of the intermediary node on the path is not known by the source endpoint, such that the source endpoint receives back a communication indicating a time at which a previously unknown node received the packet.

52. (New) The method of claim 21, wherein, at a time the trace packet is sent, existence of the destination endpoint on a path for the trace packet known by the source while existence of the intermediate node on the path is not known by the source, such that the source receives back a communication indicating a time that a previously unknown node received the trace packet.

53. (New) The method of claim 30, wherein, at a time the trace packet is sent, existence of the destination endpoint on a path for the trace packet is known by the source while existence of the intermediate node on the path is not known by the source, such that the source receives back a communication indicating a time that a previously unknown node received the trace packet.

54. (New) A method operable at an intermediary node, the method comprising:

determining, according to a Time-To-Live (TTL) value of a trace packet sent from a source node to a destination node, the intermediary node different from the destination node, to discard the trace packet;

generating, in response to the determining, an expiration message containing a time value according to when the intermediary node received the trace packet; and

sending the expiration message to the source node.

55. (New) The method of claim 54 wherein the trace packet is formatted as a media trace packet that travels along a same media path as corresponding media payload packets containing media content.

56. (New) The method of claim 55 wherein the media trace packet is sent over the media path after the media path is reserved, and the media path includes the intermediary node.